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CAPITAL STRUCTURE DETERMINANTS AMONG MANUFACTURING ENTERPRISES: THE CASE OF DEVELOPING FINANCIAL MARKETS IN GHANA AND THE GAMBIA

by

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Abstract

The focus of this study is the capital structure of non-farm manufacturing enterprises in low income countries. The study examined the importance of different sources of financing, internal and external, in the capital structure of the firm and the factors explaining entrepreneurial behavior in using different financial contracts. The capital structure was modeled by considering a one-period world within a deterministic approach. A set of testable hypotheses derived from this model was applied to a sample of 325 micro, small and medium scale manufacturing enterprises in Ghana and The Gambia. The findings of this study support the hypotheses that the characteristics of the enterprise, attributes of the entrepreneur, rates of return, interest rates, transaction costs of alternative sources of financing and the respective shares of these securities simultaneously determine the capital structure of the enterprise. Implications of this research suggest that improving formal finance, which is the emphasis of most policies, would be of benefit to all creditworthy firms. But the small size and limited collateral capacity of many firms in the sample suggest that only a few firms will obtain this source of finance. Therefore, informal finance is likely to continue to be important. Trade finance is among the most significant sources of finance in the manufacturing sector. Traders sell inputs to small enterprises on credit and customers sub-contract small enterprises to deliver custom-made products. If formal intervention schemes are necessary, then providing support through economic subs-sectors may be a most efficient method to reach small enterprises.

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I. Introduction

The limited role of manufacturing enterprises in many Sub-Saharan African (SSA) countries implies a need to examine the determinants affecting their operations and evolution. It is speculated that over the next 10 to 30 years, only a few countries will host large scale industries that will provide employment to wage laborers (World Bank). However, manufacturing subsectors, such as food processing, tailoring and metal working among others, can provide ample opportunities for small and medium scale enterprises. Consequently, it is important to have a better understanding of the factors affecting operations in these sub-sectors which will be an important source of manufacturing employment.

Despite numerous projects and policies initiated to assist micro, small and medium scale manufacturing enterprises (SMEs)[1] in low income countries (LICs), little is known about the impact these efforts have on enterprise operations and growth in these countries. The design of microenteprise programs continues to be among the priorities of many donors and policy makers concerned with securing financial and non-financial services for microentrepreneurs in low income countries. The persistent question, however, is to what extent do credit programs assist the operations and evolution of SMEs? The supply leading approach to the development of SMEs has led researchers to be wary of its consequences (Adams and Von Pischke). Enterprise development programs typically provide loans and/or technical assistance but neglect to assess the entrepreneur's effective demand for alternative financial services. Most of the literature that describes the sources of finance for this clientele in low income countries is based on a descriptive rather than a diagnostic framework (e.g. Cortes, Berry and Ishaq; Levy; McLeod; Kilby, Liedholm and Meyer). This problem persists because there is a lack of understanding and recognition of the unexplored issue of the capital structure of these enterprises.

Typically, analysts divide the supply of working capital for firms into internal and external sources when describing how micro and small scale entrepreneurs finance their operations, such as in a study of the small scale enterprise sector in Sierra Leone (Kilby, Liedholm and Meyer). The

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[1] The definition of micro, small and medium scale enterprises based on the number of employees varies in the literature (Liedholm and Parker). Some of these variations are a result of subjectivity as well as country specification.

first source of internal finance is proposed to include personal savings, gifts and informal loans from friends and family, while retained earnings, the second source, was reported as a primary source of funds that firms used for expansion. The external sources of finance for short-term credit included customers, suppliers, commercial banks and the curb market. The suggested rank order of importance is, first, customer advance payments, second accounts payable to suppliers, third, loans from commercial banks and, last, are interest bearing informal loans such as those provided by moneylenders. The suggested reasons for this rank order include cost and information advantages when choosing internal versus external sources.

Descriptive studies often report on field surveys of various sub-sectors in developing countries. The frequent identification of finance as the primary obstacle for developing small scale enterprises is based on fairly weak methodology when the source of data used is based on the entrepreneurs' own subjective responses (e.g. Levy). When asked about their access to formal finance, entrepreneurs typically respond by arguing that they have a need for credit at reasonable prices. A critical problem in the assessment of these small enterprise sector studies is that they consider formal financial contracts that entrepreneurs use as being exogenously predetermined, and not a function of the overall mix of financial services entrepreneurs use and the particular sub-sectors within which they operate.

An entrepreneur's use of alternative financial services is determined by a number of factors. These include characteristics of the enterprise, attributes of the entrepreneur, rates of return on deposits, interest rates on loans, transaction costs of using alternative sources of financing, and the respective shares of these financial assets and liabilities in total expenditures over the production period (Baydas). The characteristics of the enterprise, and the nature of the demand for and supply of alternative financial services are affected by the sub-sector within which the entrepreneur operates. In addition, the nature of the input and output linkages found among the various economic agents--producers, traders and consumers--in different sub-sectors affects the financial contracts that are available to an entrepreneur. The study of the entrepreneur's use of alternative financial services, therefore, should consider sub-sector differences.

The focus of this study is the capital structure of non-farm manufacturing enterprises in low income countries. The examination of the entrepreneur's choice among the sources of financing, internal and external, will shed some light on firm level operations in financial markets. This study draws upon modern finance literature where the issue of the capital structure of firms is discussed within two schools of thought, the optimal leverage theory and the pecking order theory. Both frameworks address the determinants of capital structure within developed financial markets. It is critical, however, that we recognize the conditions of developing financial markets prevailing in many LICs. Thus, the study presents a model which addresses the capital structure of SMEs in developing economies, derives a set of testable hypotheses and presents empirical implications based on a study of the enterprise sectors in Ghana and The Gambia.

Ghana and The Gambia are revealing countries in which to conduct this research. The Economic Recovery Program (ERP), initiated in the mid 1980s in both Ghana and The Gambia have

been judged among the most successful structural adjustment programs in SSA (Leechor; Radelet). Policy reforms have encouraged private sector development. However, despite interest rate liberalization, reduction of inflation, trade and exchange rate reforms, and deregulation of input and output markets, there are continuing problems of financial deepening in both countries. Formal financial institutions play at best only a modest role in the provision of financial services to the private sector (Baydas and Graham; Pollard et al.). Rather than mobilizing savings and intermediating between deficit and surplus units in the private sector, commercial banks invest a large share of their liabilities in secure government treasury-bills (t-bills). Therefore, given that there is little domestic credit flowing to the private sector, it is important to analyze how micro, small and medium scale manufacturing enterprises manage to finance their operations.

The following section reviews the capital sturcture determinants in developed and developing countries. Section three presents the theoretical framework used to analyze the determinants of the capital structure of non-farm manufacturing enterprises in LICs. Section four discusses the enterprise surveys conducted in Ghana and The Gambia and the data used in the study. Section five reviews the econometric methods and the results of the model. Finally, the last section draws together the summary and conclusions.

II. Capital Structure Determinants in Developed and Developing Capital Markets

Several theoretical arguments have been advanced during the past two decades, mostly in relation to the theory of optimal leverage, to explain the capital structure of business firms in developed economies. A more recent line of thought addresses the capital structure puzzle by advancing the pecking order theory. Empirical testings of these theories have been limited exclusively to industrial economies with developed capital markets. It is surprising that, thus far, no theoretical framework has been developed to analyze the capital structure of SMEs in LICs. There exists a body of literature, however, which provides descriptions of the various sources of finance entrepreneurs generally draw upon in LICs. The developed capital market theories and the descriptive studies in LICs will be briefly reexamined to introduce the framework for this study.

The firm's optimal debt to asset ratio is viewed as that which would minimize the firm's composite cost of capital (Wijst). In addition to the direct costs of borrowing, the indirect costs of borrowing have been associated with taxes, bankruptcy costs, agency costs and signalling effects (Harris and Raviv). Many of the hypothetical assumptions upon which these models are based include costless, competitive and complete capital markets (Stiglitz; Wijst). These assumptions imply that there are no transactions costs, there is complete information and financial assets are costlessly and infinitely divisible. The reasoning behind these assumptions, often imposed based upon the developed capital markets, does not hold in developing capital markets in LICs. The pecking order theory, however, does not assume a perfect capital market structure but rather underscores some important imperfections in financial markets such as asymmetric information and transaction costs as well as the costs of financial distress.

The pecking order theory is not concerned with an optimal debt level of the firm (Myers). Financing decisions, in addition to being affected with cost considerations, are impacted by control and disclosure factors. Many of the asymmetric information problems, such as adverse selection and moral hazard, which result in signalling effects and agency costs are suggested to induce additional costs when using external sources of finance. This implies that firms are inclined to use a sequential rank order in the sources of finance. "Safety first" (i.e. not losing ownership control of the firm) is a principle that has been used to rank the preferred sources of financing that the firm draws upon in priority order (Cuevas; Myers). It is argued that firms choose to finance investments first from internally generated funds since this represents the safest source of financing. External sources of financing, therefore, are ranked second. In the case where external finance is required the safest sources are also drawn upon first. External finance may be divided into informal and formal sources. Informal sources include loans from relatives and friends, investments by relatives and friends, and trade credit from both suppliers and customers. Formal sources are further divided into financial intermediaries and public capital markets. Financial intermediaries include bank and non-bank financial institutions as well as venture capital companies. Public markets consist of bond issues and stock issues. These public market sources, however, are less frequently available in developing than in developed capital markets.

A recent study by the International Finance Corporation underscores the sparse empirical work in the area of corporate capital structures in developing countries and provides some preliminary analysis of large corporations in nine countries (Singh and Hamid). The sample includes the top 50 manufacturing companies quoted on the stock market of each of the nine countries, namely, India, South Korea, Pakistan, Thailand, Mexico, Malaysia, Turkey and Zimbabwe. The study finds that corporate capital structures in developing countries differ largely from those in developed countries. In developed countries, and in accordance with the pecking order theory, corporate growth is financed mainly from internal sources and to the extent external finance is used, debt is employed significantly more than equity finance. Data from the developing countries included in the study, however, indicate that large corporations rely more heavily on the use of external compared to internal finance and use equity finance to a large extent whenever available.

Another body of literature describes the sources of finance for micro, small and medium scale enterprises in low income countries through an empirical framework (Cortes et al.; Kilby et al.). In general, most of these studies identify the prevalent sources of finance microentrepreneurs use and document the frequently reported constraint: "limited access to credit". An intriguing counter argument put forth by McLeod (1991) confronts the popular belief that finance is the most binding constraint encountered by small scale enterprises. This argument is based on empirical results which show that ample financing options, both internal and external, are providing competitive sources of finance and, thus, more competition for lenders and in particular for banks. The argument also highlights, without rigorous analysis, that self-financing is the most commonly used source of finance by choice and not by default, i.e. because of denied access to other sources. Thus, the author suggests that: "it seems more plausible to argue that lack of entrepreneurial ability makes access to finance difficult, rather than that lack of access to finance holds back entrepreneurship." (McLeod, 1991, pp. 262-263).

III. The Theoretical Model

The theoretical framework describing the capital structure of the enterprise may be modeled by considering a one-period world where entrepreneurs possess a certain amount of wealth which is to be allocated among different assets (Baydas).[2] The starting point of the analysis considers an entrepreneur who knows with certainty the production outcome and all other variables in the model. The entrepreneur operates a manufacturing business where output is produced using a stock of physical capital (K) and a flow of variable inputs. The vector of variable inputs used in production makes up the operating costs which add up to total expenditure (T) over the production period. Moreover, entrepreneurial or managerial abilities (A) are considered as an indirect input in the production function. Proxy variables, such as the characteristics of the entrepreneur and enterprise, specified in table 1, capture the effects of entrepreneurial abilities. The price of output (P) is exogenous and the firm's revenue is specified as: $Y = Y(K, T, A, P)$.

The entrepreneur augments initial wealth, or equity, (W) by drawing on external sources of financing. The different sources of external finance are non-commercial informal loans (IL) from fellow entrepreneurs, friends and relatives, trade finance from suppliers and customers (TL), and formal loans (FL) from commercial banks and other non-bank institutions such as microenterprise programs. The entrepreneur allocates the resources available to the firm among financial assets (FA) and physical assets (K). The various forms of financial assets are: cash holdings (C), informal holdings with moneykeepers, sus collectors and rotating savings and credit associations (IH), and formal deposits with commercial banks (D). Over the production period, the entrepreneur draws upon the alternative financial assets and liabilities to finance the cost of inputs. The returns (r), interest rates (i) and transaction costs (t) associated with these assets and liabilities are respectively: (r_i), (i_j) and $(t_{i,j})$, where (i= C, IH, D; j= IL, TL, FL). Table 1 presents a summary of the abbreviated variable names and their definitions.

Following the standard microeconomic theory of the firm, the problem can be specified as a maximization of retained earnings in the objective function with respect to the decision variables (K, T, C, IH, D, IL, TL, FL) subject to a balance sheet constraint and an expenditure flow identity. Differentiating with respect to the decision variables yields the first order conditions. Solving the first order condition equations for the proportions of the different sources of financing (C/T), (IH/T), (D/T), (IL/T), (TL/T) and (FL/T) for a given (T) yields the following simultaneous equations system:

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[2] A detailed explanation of the model is presented in the appendix.

$$(\frac{C}{T})=\beta_{10}+\beta_{11}(t_C)+\beta_{12}(r_C)+\beta_{13}(i_{IL})+\beta_{14}(t_{IL})+\beta_{15}(\frac{IL}{T})+\beta_{16}(Y_K) \quad (1)$$

$$(\frac{IL}{T})=\beta_{20}+\beta_{21}(t_{IL})+\beta_{22}(i_{IL})+\beta_{23}(r_{IH})+\beta_{24}(t_{IH})+\beta_{25}(\frac{IH}{T})+\beta_{26}(Y_K) \quad (2)$$

$$(\frac{IH}{T})=\beta_{30}+\beta_{31}(t_{IH})+\beta_{32}(r_{IH})+\beta_{33}(i_{TL})+\beta_{34}(t_{TL})+\beta_{35}(\frac{TL}{T})+\beta_{36}(Y_K) \quad (3)$$

$$(\frac{TL}{T})=\beta_{40}+\beta_{41}(t_{TL})+\beta_{42}(i_{TL})+\beta_{43}(r_D)+\beta_{44}(t_D)+\beta_{45}(\frac{D}{T})+\beta_{46}(Y_K) \quad (4)$$

$$(\frac{D}{T})=\beta_{50}+\beta_{51}(t_D)+\beta_{52}(r_D)+\beta_{53}(i_{FL})+\beta_{54}(t_{FL})+\beta_{55}(\frac{FL}{T})+\beta_{56}(Y_K) \quad (5)$$

The objective of this model is to examine the capital structure of the firm using the structural system of simultaneous equations which accounts for the endogeneity of financial contracts in different sub-sectors.

III. Data from the Enterprise Surveys in Ghana and The Gambia

The Enterprise Survey in Ghana

To examine the alternative financial networks in the manufacturing enterprise sector in Ghana a survey of 175 micro, small, medium and large scale manufacturing enterprises was carried out in March and April of 1994. The surveyed enterprises were selected in Accra and in the peri-urban region of Accra which included the towns of Nsawam and Aburi. This dynamic area was chosen because it is the only region in the country in which one finds a large and diverse number of manufacturing enterprises across various sub-sectors and size categories that could provide information about the issues in question. The enterprise survey covered four sub-sectors in the manufacturing sector. These consisted of textile and tailoring establishments, furniture and wood processing enterprises, artisanal wood-crafts producers and food processing bakeries. Over 40 enterprises were surveyed in each sub-sector.

These enterprises were operated primarily by owners (89 percent) with an average value of physical assets of 255,927,000 (US$ 260,000). This value, however, varies substantially by sub-sector. The average number of employees in the surveyed enterprises was 25 persons; however, the range of employees was from 0 to 2310 workers. Thus, the sample includes micro, small, medium and large scale enterprises that have been in operation on average for 11 years. The sources of funding and the savings channels entrepreneurs draw upon are various. They fall into informal and formal networks. The informal channels that were found to prevail in Ghana include family, friends, suppliers credit, customer advances, Susu groups (Rotating Credit and Savings Associations, or RoSCAs), and susu collectors. Although the formal financial sector is expanding in Ghana, formal channels reported to be used by the entrepreneurs only include commercial banks. The sources of funding in the peri-urban areas of Nsawam and Aburi were principally retained earnings, trade finance and informal loans, while in urban Accra they were retained earnings, trade finance, formal loans and informal loans.

Sources of finance for current operations include both informal and formal channels, although they are concentrated on informal agents (Table 2). First, most of the entrepreneurs (93 percent) operating in the four sub-sectors reported that they use retained earnings as a source of financing their current operations. Second, about 45 percent of the entrepreneurs in the four sub-sectors reported that they draw upon informal sources of finance from other enterprises, or family and friends in their current operations. Third, 49 percent of the entrepreneurs in the total sample reported using customer advances to finance their business operations. This channel of finance is very significant for furniture-wood processing and textile-tailoring manufacturers. Customer advances were a source of financing for 93 percent of the entrepreneurs operating furniture-wood processing enterprises and for 62 percent of the entrepreneurs operating textile-tailoring enterprises. Fourth, supplier credit is an important source of financing for most entrepreneurs. It was used by 65 percent of the total sample. It stands out in the case of bakeries where 83 percent reported frequent use of this source of finance in purchasing their input materials. The majority of the wood carvers (73 percent) also reported drawing on input supplier financing when purchasing their inputs. Roughly, half of the furniture-wood processors and the textile-tailoring entrepreneurs (58 and 46 percent respectively) reported using supplier credit. In general, trade credit, which consists of customer advances and supplier credit, is used by the majority of the entrepreneurs (84 percent) in the sample. Fifth, and last, a total of 22 percent of the interviewed entrepreneurs have acquired formal finance for the purpose of operating their businesses.

Entrepreneurs in the sample were found to participate in different savings channels (Table 2). Formal channels consisted of accounts in commercial banks. The informal channels are represented by susu groups and susu collectors. Among the most common savings channels are the commercial banks. Roughly two thirds of the entrepreneurs in the three sub-sectors (all but bakeries) held at least one account with one of the commercial banks in the country. Susu groups are the second most widely used saving channel among the entrepreneurs in the sample. About 11 percent of the entrepreneurs reported participating in susu groups. The concentration of susu groups is largely among the microenterprises in the traditionally female dominated professions of tailoring and bakeries. Some groups, however, were found among the male dominated

professions of wood carving and furniture manufacturing. A number of entrepreneurs participated in susu groups previously but had stopped due to encountering problems in the management of susu funds. Some of the reasons given for ceasing membership included reports that payments were being delayed or lack of confidence in the susu leader. In the peri-urban towns the most characteristic channels for savings were deposit accounts with formal institutions, informal groups and susu collectors, while in urban Accra deposit accounts with formal institutions stands out.

In summary, the sources of finance may be characterized in a rank order starting with the most to the least utilized. First is retained earnings as the overwhelming source; second are customer advances and supplier credit; third comes informal sources from other enterprises, family and friends; and last is formal finance (i.e. either bank or non-bank financial institution finance). This preliminary rank order falls in line with the pecking order theory of finance that was tested subsequently. However, sub-sector differences may indicate that some sources may play a more significant role for entrepreneurs operating in one sub-sector than for those working in another. Moreover, the array of saving channels and the different concentrations of entrepreneurs by sub-sector among these channels indicates very important findings. Monetary savings are very important to entrepreneurs. Almost every entrepreneur has used at least one savings channel to keep her/his deposits as a means to manage liquidity of the enterprise. Moreover, entrepreneurs draw upon formal channels, commercial banks in general, as well as on informal channels, such as susu groups or collectors, to deposit their savings.

The Enterprise Survey in The Gambia

To examine the alternative sources of financing used by manufacturing industries in various sub-sectors, a survey of 153 micro, small and medium scale enterprises was carried out in March and April, 1992, in The Gambia. The survey covered the four principal sub-sectors in the country's small manufacturing sector. These consisted of bakeries, both traditional and modern, metal workshops, tailoring workshops and tie-dye producers. Roughly 40 enterprises were surveyed in each sub-sector. These enterprises were operated primarily by owners (84 percent) with an average value of physical assets of D128,727 (US$ 14,464). This value, however, varies substantially by sub-sector. The average number of employees in the surveyed enterprises was five persons; however, the range of employees was from 0 to 26 workers. Thus, the sample includes micro, small and a few medium scale enterprises. The average firm has been in operation for 10 years and the average business experience for an entrepreneur before starting her/his current business was five years. The survey did not exclude large enterprises, but larger enterprises do not exist in the manufacturing sector in The Gambia.

Most of the external funds used to finance current operations are obtained from informal sources (Table 2). This is not surprising considering the attractiveness of the t-bills for financial institutions relative to lending to enterprises. First, all entrepreneurs operating in the four sub-sectors reported that they use retained earnings as a source of financing for their current operations. Second, about 67 percent of the entrepreneurs reported that they use informal sources of finance obtained from other enterprises, or family and friends in their current operations.

Third, informal financial savings were a significant source of financial services for 30 percent of the entrepreneurs who participated in rotating savings and credit associations and for 12 percent who held deposits with moneykeepers.

Fourth, 62 percent of the entrepreneurs in the total sample reported receiving customer advances to assist in financing their business operations. This source is especially significant for tailoring and metal workshops that produce custom made products for their clients. Customer advances were a source of financing for 97 percent of the metal workshops and for 92 percent of the tailoring workshops. Fifth, suppliers credit was an important source of financing used by 32 percent of the total sample. This type of finance is significant for bakeries, both modern and traditional, where 85 percent and 81 percent of the bakers, respectively, reported the frequent use of this source to purchase their inputs. Sixth, and last, only 23 percent of the entrepreneurs interviewed acquired formal finance for operating their businesses. Important sub-sector differences were found in that formal loans are significant for modern bakeries, but much less significant for the other sub-sectors.

IV. Econometric Methods and Analysis

The allocations of financial assets and liabilities used to finance the firm's operating costs for a given period are jointly determined in a structural system of simultaneous equations (eqs. 1-5). The empirical model that is derived from the general structural simultaneous equations system involves the observed amounts of financial assets and liabilities used to finance the operating costs for a given period. The array of different financing sources that an entrepreneur may use to fund total expenditures represents some zero and non-zero amounts for the variables (C/T, IL/T, IH/T, SL/T, D/T, FL/T) on the left hand side (LHS) of the equations in the model. The sequential two-stage estimation technique used in the study involves, first, estimating the reduced form equations using the standard tobit model for equations with limited LHS variables or least squares for unconstrained LHS variables, as appropriate for each reduced form equation (Tables 3 and 5). Second, we obtain the predicted values of the endogenous variables from step 1, and insert the predictors for the endogenous variables on the RHS of the equations in the structural model. Third, we estimate the structural equations using the tobit maximum likelihood technique or least squares to generate the results of the model presented in tables 4 and 6. This methodology is similar to that used in Nelson and Olson's model (1978), reviewed by Amemiya (1984) under a type 4 tobit model, which generates consistent and asymptotically normal estimates.

Implications of the Model in Ghana

The findings of the model in Ghana imply, first, that larger asset holdings are negatively associated with informal holdings (Table 4). This result is expected since larger investments in physical capital are associated with carrying smaller amounts of informal holdings. The long-term effects as indicated from the reduced form equations (Table 3), however, imply as expected that

a larger value of physical assets which is a proxy for collateral is associated with increases in formal loans as a proportion of total expenditure. Formal lenders often use collateral to screen borrowers and resolve part of the asymmetric information problems. Larger amounts of informal holdings, trade loans and formal deposits, on the other hand, are associated with increases in profitability. This implies that entrepreneurs engaged in more profitable activities hold larger amounts of informal and formal deposits, since they are able to generate more earnings, and acquire larger amounts of trade finance from suppliers and customers.

Larger enterprises, proxied by the number of employees, are associated with using smaller amounts of cash and smaller amounts of informal loans and formal deposits because they find the opportunity cost of idle cash high. However, the reduced form equations surprisingly indicate that formal loans decrease with increases in the size of the enterprise implying that the long-term effect for large enterprises is to use less debt financing, a finding consistent with the pecking order. Increases in informal loans and informal holdings are negatively associated with increases in the age of the business. However, the long-term effects indicate that formal deposits increase with increases in the age of the business.

Sub-sector differences indicate that entrepreneurs operating furniture, tailoring and carving workshops are positively associated with having larger amounts of formal deposits as a proportion of total expenditure than entrepreneurs operating bakeries indicating a larger demand for savings. Entrepreneurs engaged in furniture manufacturing also draw upon trade finance to a larger extent than entrepreneurs operating in the other sub-sectors. This finding may be explained by the large observed amounts of customer advances flowing to furniture workshops and trade credit offered to carpenters versus the more limited amounts of customer advances or supplier credit that tailors, bakers or carvers use. On the one hand, carvers and carpenters use more informal loans than other entrepreneurs, while on the other hand, carpenters and tailors use more cash than other entrepreneurs.

Among the characteristics reflecting entrepreneurial abilities, age of the entrepreneurs indicates that older entrepreneurs use more informal loans and informal holdings compared to younger entrepreneurs. The long-term effects indicate also, that older entrepreneurs tend to use more retained earnings than younger entrepreneurs. These findings imply that older entrepreneurs use safer sources of financial assets such as internal and informal finance as suggested in the pecking order theory. Education coefficients indicate that more educated entrepreneurs use more cash or retained earnings and informal holdings and less trade loans as a proportion of total expenditure than less educated entrepreneurs. This is contrary to expectation because more educated entrepreneurs are presumed to be better informed and able to access external finance easily. However, this finding is in line with the pecking order theory which suggests that entrepreneurs choose safer sources of finance first. Over the long run, more educated entrepreneurs hold more formal deposits than less educated entrepreneurs. Increases in the number of years of the entrepreneur's previous experience is associated with using less cash and more informal loans. Finally, gender of the entrepreneur indicates that female entrepreneurs have

larger amounts of formal deposits with formal institutions than male entrepreneurs indicating a more risk averse behavior.

The rates of return on informal and formal deposits are positively associated with higher holdings of these financial assets. However, the interest rates on financial liabilities do not seem to have a significant effect except for trade loans where the relationship is positive, contrary to expectation, but of a small magnitude. Transaction costs are generally positively associated with the respective amounts of financial assets and liabilities; however, the magnitude of these effects are relatively small.

Finally, there are two significant relationships among the financial assets and liabilities. First, increases in informal holdings are positively associated with increases in informal loans and, second, increases in deposit holdings are negatively associated with increases in formal loans as a proportion of total expenditure. The first relationship indicates that entrepreneurs may complement the use of internal sources of financing with safe sources of external finance. This relationship is in agreement with the pecking order theory which suggests the use of internal sources of financing or safe sources of external finance rather than drawing on risky sources of external finance. Second, the relationship between formal deposits and formal loans implies that entrepreneurs would draw more on internal sources of finance, i.e. deposits, and less on risky sources of external finance, i.e. formal loans. This inverse relationship is also in agreement with the pecking order theory which implies these two sources are substitutes rather than complements.

Implications of the Model in The Gambia

The first important result of the model in The Gambia confirms that several differences exist among sub-sectors. Entrepreneurs operating bakeries, and metal and tailoring workshops are associated with larger amounts of informal savings as a proportion of total expenditure than entrepreneurs in tie-dye production (Table 6). Entrepreneurs engaged in metal work and tailoring also utilize trade finance to a larger extent than entrepreneurs in the other sub-sectors. Moreover, the reduced form equations in table 5 indicate that the long-term trend for entrepreneurs operating bakeries and metal workshops is to hold smaller amounts of formal deposits, while entrepreneurs operating tailoring workshops hold larger amounts of formal deposits as a proportion of total expenditures.

Second, the findings imply that a larger value of total assets are negatively associated with informal savings. However, the long-term effects, as indicated from the reduced form equations, imply that a larger value of total assets is associated with larger formal loans as a proportion of total expenditures and with smaller formal deposits. Larger total assets are typical of modern bakeries and it is expected that a positive relation would hold with formal loans. Larger amounts of informal savings, trade loans and formal deposits are associated with higher profitability. This implies that entrepreneurs engaged in more profitable activities, such as tailoring, hold larger amounts of informal and formal deposits, and acquire larger amounts of trade finance from suppliers and customers. Moreover, larger enterprises, proxied by the number of employees, are

associated with smaller amounts of informal loans, but with larger amounts of trade loans and formal deposits.

Third, entrepreneurs with more years of previous experience utilize fewer formal loans than entrepreneurs with less experience. Moreover, higher levels of education and more previous experience are associated with larger formal deposits. These results could represent more risk averse behavior. Female entrepreneurs tend to hold more informal and formal savings than their male counterparts. This result may also imply that female entrepreneurs exhibit more risk averse behavior than males.

Fourth, rates of return, interest rates and transaction costs are significantly associated with their respective sources of financing indicating the importance of prices in determining the sources of finance that entrepreneurs use. Fifth, and finally, the negative relationship between trade loans and deposits supports the idea of substitution of financial sources that is consistent with the pecking order theory. However, the positive relationship between deposits and formal loans supports the concept of complimentarity of these types of financial services which is consistent with asymmetric information and credit rationing theory.

The findings of the model can be summarized to indicate a set of relationships describing enterprise and entrepreneurial characteristics associated with the use of different financial assets and liabilities across different sub-sectors. Informal loans are larger for smaller enterprises, those which have been in operation for a long time and for more educated entrepreneurs. Increases in informal savings are associated with a decreased value of physical capital, increased profitability, enterprises in the bakeries, metal working and tailoring subsectors, and for female entrepreneurs. Increases in trade loans are associated with increases in profitability, increased size of the enterprise, and enterprises operating in the metal working and tailoring subsectors. Increases in deposit holdings are associated with increases in the size of the business, education, previous experience of the entrepreneur and for female entrepreneurs. Increases in formal loans, as indicated from the long-term multiplier effects, are associated with increase in the value of physical capital, and with decreases in the size of business and decrease in previous experience of the entrepreneur. Finally, decreases in trade loans are associated with increases in deposit holdings and, second, increases in deposit holdings are associated with increases in formal loans.

V. Summary and Conclusions

The objective of this study was to analyze the differences in the sources of financing used by non-farm manufacturing enterprises in low income countries. The study advanced a theoretical model to analyze how various sources of finance simultaneously determine the capital structure of the firm. The model presented in this study extends the standard capital structure analysis by incorporating financial transactions as endogenous factors within the financial strucuture model. More specifically, the model examines the entrepreneurs' choice of the capital structure of the firm by deriving a structural system of simultaneous equations which accounts for the endogeniety

of financial contracts in different sub-sectors. The study presents empirical implications based on a study of four sub-sectors in Ghana and in The Gambia.

The characteristics of the subsector within which an entrepreneur operates can be expected to make a significant difference in the sources of finance that individual enterprises utilize. On the one hand, trade credit is an important source of finance for enterprises that demand and purchase inputs from suppliers willing to sell on credit, and for those enterprises that manufacture custom-made products, such as metal and wood products and tailoring, where customers pay in advance for their orders. On the other hand, informal savings and formal deposit holdings are significant sources of finance in the traditionally female profession of tailoring. Entrepreneurs operating in the male dominated professions of bakeries and metal work, however, deposit largely with informal moneykeepers and susu collectors rather than with formal institutions. The subsector of operation does not seem to affect the entrepreneurs' use of formal loans directly, although entrepreneurs with larger assets, such as modern bakeries, are associated with using more formal loans.

These results are important because they show that if enterprises are profitable, have a large number of employees, have competing sources of input supplies or customer demand and are operated by entrepreneurs who had a large amount of experience in the line of business before starting their businesses, entrepreneurs would use more internal and informal sources of finance and less formal finance. The use of informal financial services, such as trade credit, is positively associated with the use of formal deposit holdings. The use of formal finance, however, remains the domain of entrepreneurs who can provide more information, such as a higher value of working assets which is a proxy for collateral, that reduces asymmetry problems for formal institutional lenders.

The relevance of the pecking order theory raises serious questions about the cost effectiveness of allocating large amounts of resources into expensive microenterprise programs in LICs. Trade liberalization policies may have a more positive impact on increasing competition among input suppliers and open new channels for sale of output in expanded markets. Intervention schemes should focus on enhancing vertical linkages and output marketing channels that in turn would generate a larger demand for microenterprise products. Financial programs and liberalization policies should further stress savings mobilization and induce more competition in financial markets between formal and informal intermediaries.

Improving formal finance, which is the emphasis of most policies, would be of benefit to all creditworthy firms. But the small size and limited collateral capacity of many firms in the sample suggest that only a few firms will obtain this source of finance. Therefore, informal finance is likely to continue to be important. Trade finance is among the most significant sources of finance in the manufacturing sector. Traders sell inputs to small enterprises on credit and customers sub-contract small enterprises to deliver custom-made products. If formal intervention schemes are necessary, then providing support through strategic input suppliers in these subs-sectors may be the most efficient method to reach small enterprises.

Table 1. Definition of Variables in the Simultaneous Equations Model of the Different Sources of Financing Shares Relative to Total Expenditures

Variables	**Definition**
Exogenous Variables	
K	Physical assets (Cedis/Dalasis);
P	Total value of output (Cedis/Dalasis);
T	Total cost of inputs (Cedis/Dalasis);
EMPLY	Number of employees;
YRS	Number of years the enterprise has been in operation;
CRV	Dummy variable = 1 for wood-carvers;
CRP	Dummy variable = 1 for carpenters;
BKR	Dummy variable = 1 for bakeries;
MTL	Dummy variable = 1 for metal workshops;
TLR	Dummy variable = 1 for tailoring workshops;
AGE	Age of the entrepreneur (Years);
EDUC	Educational level of the entrepreneur;
XEXP	Number of years of previous experience in line of business;
GENDER	Dummy variable = 1 for male entrepreneurs;
RC	Rate of return on cash holdings;
IIL	Interest rate on informal loans;
RIH	Rate of return on informal savings;
ITL	Interest rate on trade loans;
RD	Rate of return on deposits;
IFL	Interest rate on formal loans;
TCC	Transaction costs associated with cash holdings (Km);
TCIL	Transaction costs associated with informal loans (Km);
TCIH	Transaction costs associated with informal savings (Km);
TCTL	Transaction costs associated with trade loans (Dalasis);
TCD	Transaction costs associated with deposits (Km);
TCFL	Transaction costs associated with formal loans (Km);
Endogenous Variables	
CT	Cash holdings relative to total cost of inputs;
ILT	Informal loans relative to total cost of inputs;
IHT	Informal savings relative to total cost of inputs;
TLT	Trade loans relative to total cost of inputs;
DT	Deposits relative to total cost of inputs;
FLT	Formal loans relative to total cost of inputs.

Table 2. Current Funding Sources Reported in the Enterprise Survey.

	GHANA				THE GAMIA				
	Textile & Tailoring	Furniture Workshops	Artisanal Wood-Crafts	Bakeries	Tailor Workshops	Metal Workshops	Tie-Dye Producers	Bakeries	
								Modern	Traditional
Sources of Funds for Current Operations									
Entrepreneurs Using Retained Earnings (Cash)	88%	93%	100%	91%	100%	100%	98%	100%	100%
Entrepreneurs Using Informal Loans	33%	53%	61%	37%	50%	68%	85%	54%	69%
Entrepreneurs Using Trade Credit (Supplier/Customer)	75%	95%	85%	83%	92%	97%	63%	85%	84%
Entrepreneurs Using Formal Loans	19%	30%	44%	0%	39%	10%	22%	69%	0%
Savings Channels									
Share of Sample Entrepren. with Deposits in Formal Institution	73%	78%	63%	25%	47%	16%	25%	91%	0%
Entrepreneurs Participating in Informal Groups	17%	8%	10%	11%	44%	5%	65%	0%	8%
Entrep. Saving with Susu Collectors or Money-Guards	12%	0%	2%	13%	0%	16%	8%	0%	39%

Source: OSU Enterprise Survey, 1993.
Note: % corresponds to percentage of sample within a sub-sector or for all enterprises in the survey.

Table 3. Reduced Form Equations of the Different Sources of Financing Relative to Total Expenditure Results in Ghana (Linear-Log Functional Form).

Variables	OLS (CT)	TOBIT (ILT)	TOBIT (IHT)	TOBIT (TL/T)	TOBIT (DT)	TOBIT (FLT)
Const.	-	- **	- ***	+ **	+ **	-
LK	-	-	- **	-	-	+ ***
LPT	+	-	+ **	+ ***	+	+
LEMPLY	- **	- **	+	+	-	- **
LYRS	-	-	- *	+	+ *	+
CRV	-	+	-	+	+ **	+
CRP	+ **	+ *	-	+ ***	+ ***	+
TLR	+ *	+ **	-	+	+ ***	+
LAGE	+ *	+ **	+ **	-	-	+
LEDUC	+ **	+	+ ***	- ***	+ ***	- *
LXEXP	-	+ *	-	+	-	+
GENDER	+	-	+	+	-	-
LRC	+	+	-	-	+	- **
LIIL	+	+ ***	-	-	+	+
LRIH	+ *	-	+ ***	-	-	-
LITL	-	-	-	+	+ *	-
LRD	-	-	+	- **	+ **	-
LIFL	+	+	+	-	+ ***	+ ***
LTCC	-	-	+	+	-	+ *
LTCIL	+	+ ***	-	-	- ***	- *
LTCIH	+	+	-	+	+ **	-
LTCTL	- ***	-	+ *	+ **	- *	+
LTCD	-	+	+ *	- *	+	+
LTCFL	-	+	-	+	+ ***	+ *
R-SQR	0.38					
LH		-24.86	0.49	-179.54	-23.81	-23.77

***, ** & * represent significance at 1, 5 and 10 percent levels, respectively.

Table 4. Second-Stage Structural Equation Estimation of the Different Sources of Financing Relative to Total Expenditure Results in Ghana (Linear-Log Functional Form).

Variables	OLS (CT)	TOBIT (ILT)	TOBIT (IHT)	TOBIT (TL/T)	TOBIT (DT)
Const.	-0.160 (0.462)	-5.233 *** (1.774)	-10.231 * (6.502)	2 755 ** (1.543)	-1.846 (1.586)
LK	-0.011 (0.017)	-0.022 (0.069)	-0.584 ** (0.307)	-0.027 (0.062)	0 689 (0.077)
LPT	0.017 (0 025)	-0.015 (0.109)	0 591 * (0.416)	0.308 *** (0 097)	0.158 * (0.097)
LEMPLY	-0 051 * (0.036)	-0.305 ** (0.134)	0.247 (0 368)	0 050 (0.118)	-0.238 ** (0.127)
LYRS	0.042 (0.037)	-0.193 * (0.149)	-0 635 * (0 391)	0.069 (0.136)	0.099 (0.155)
CRV	-0.119 (0.136)	0.689 * (0.503)	-1.855 (1.539)	0.159 (0.522)	1.977 *** (0.539)
CRP	0.259 ** (0.122)	0.833 ** (0.470)	-1.298 (2.190)	1.247 *** (0.484)	1.552 *** (0.444)
TLR	0.199 ** (0.107)	0.955 (0.350)	-1.269 (1.062)	0.290 (0.398)	1.444 *** (0.353)
LAGE	0.148 (0.140)	1.289 *** (0.513)	2.975 ** (1.485)	-0.540 (0.437)	0.007 (0.466)
LEDUC	0.060 ** (0.034)	0.148 (0.146)	0.992 ** (0.597)	-0.297 *** (0.126)	0.159 (0.145)
LXEXP	-0.048 * (0.034)	0.185 * (0.119)	-0.415 (0.389)	0.007 (0.104)	0.027 (0.111)
GENDER	0.079 (0.084)	-0.119 (0.354)	0.363 (0.916)	0.231 (0.322)	-0.687 ** (0.315)
LRC	0.2E-02 (0.038)				
LIIL	-0.057 (0.055)	0.440 *** (0.136)			
LRIH		0.184 (0.227)	1.449 *** (0.253)		
LITL			-0.399 (0.402)	0.139 (0.124)	
LRD				-0.363 * (0.255)	0.622 *** (0.199)
LIFL					0.119 (0.119)
LTCC	-0.019 (0.019)				
LTCIL	-0.069 (0.055)	0.464 *** (0.099)			
LTCIH		0.018 (0.303)	-0.404 (0.334)		
LTCTL			0.086 (0.154)	0.076 ** (0.035)	
LTCD				-0.075 (0.098)	0.344 *** (0.073)
LTCFL					0.111 (0.153)
ILHAT	1.224 (0.951)				
IHHAT		3.125 * (2.101)			
TLHAT			-0.495 (1.992)		
DHAT				-0.464 (1.294)	
FLHAT					-1.867 ** (0.996)
R-SQR	0.28				
LH		-25.38	-2.22	-180.01	-34.47

Asymptotic standard errors are reported in parentheses.
***, ** & * represent significance at 1, 5 and 10 percent levels, respectively.

Table 5. Reduced Form Equations of the Different Sources of Financing Relative to Total Expenditure Results in The Gambia (Linear-Log Functional Form)

Variables	OLS (CT)	TOBIT (ILT)	TOBIT (IHT)	TOBIT (TL/T)	TOBIT (DT)	TOBIT (FLT)
Const.	+	+	+	+	- **	- ***
LK	-	-	- **	+	- **	+ **
LPT	-	+	+ ***	+ ***	+ *	+
LEMPLY	-	- **	- *	+ *	+	- ***
LYRS	+	+ **	-	-	+	+
BKR	-	+	+ ***	-	- ***	-
MTL	+	-	+ ***	+ ***	- ***	+
TLR	+	+ *	+ **	+	+ **	+
LAGE	-	-	-	-	+	+
LEDUC	+	+	-	-	+ *	+
LXEXP	-	-	+	+	+	- ***
GENDER	-	+	- ***	+	-	+
LRC	-	+	+ *	+ *	-	- **
LIIL	-	+	-	+	+ ***	-
LRIH	+	-	+ ***	+	-	-
LITL	-	+	-	+ **	+ *	+ **
LRD	-	+	- ***	-	+ ***	-
LIFL	-	-	+	-	+	+
LTCC	-	+	- *	+ *	- ***	- **
LTCIL	-	+ **	-	-	-	+ **
LTCIH	-	+	+ ***	-	+ ***	+
LTCTL	+	+	-	-	+ ***	+
LTCD	-	+	- **	-	- ***	- *
LTCFL	+	- *	+	+	+ *	+ ***
R-SQR	0.23					
LH		140.42	-97.25	-98.33	-1.08	19.02

***, ** & * represent significance at 1, 5 and 10 percent levels, respectively.

Table 6. Second-Stage Structural Equation Estimation of the Different Sources of Financing Relative to Total Expenditure in The Gambia (Linear-Log Functional Form)

Variables	OLS (CT)	TOBIT (ILT)	TOBIT (IHT)	TOBIT (TL/T)	TOBIT (DT)
Const.	1.303	1.268	3 415	-0.774	-3 162
	(1 142)	(1.681)	(2 753)	(2.824)	(3.668)
LK	-0.4E-01	0.080	-0.503 ***	0 025	-0.123
	(0.5E-01)	(0.088)	(0.168)	(0.102)	(0.102)
LPT	-0.083	0.117	0.728 *	0.940 ***	0.282
	(0.158)	(0.244)	(0.465)	(0.236)	(0.276)
LEMPLY	-0 073	-0.357 *	-0.360	0.333 *	0.379 *
	(0 161)	(0 199)	(0.344)	(0 188)	(0.243)
LYRS	0.027	0.230 *	0.095	-0 029	0.060
	(0.084)	(0 122)	(0 178)	(0 117)	(0.145)
BKR	-0.324	-0.485	4 740 ***	0 180	0.256
	(0.284)	(0.485)	(0.942)	(0 483)	(0.719)
MTL	0.203	-0.313	3.919 ***	1 430 ***	0.372
	(0.239)	(0.391)	(1.088)	(0 379)	(0.514)
TLR	0.218	0.322	1.188 *	0.882 *	0.020
	(0.266)	(0.379)	(0.674)	(0.465)	(0.468)
LAGE	0.051	-0.620	-1.049	-0 145	-0.162
	(0.361)	(0 489)	(0.713)	(0.473)	(0.629)
LEDUC	0.101	0.229 **	0.039	-0.053	0.304 **
	(0.086)	(0.112)	(0.183)	(0.105)	(0.128)
LXEXP	-0.093	-0.163	0.013	0.105	0.290 *
	(0.087)	(0 130)	(0 183)	(0.129)	(0.168)
GENDER	-0.183	0.462	-1.084 **	0.443	-0.798 **
	(0.224)	(0.333)	(0.497)	(0.289)	(0.354)
LRC	-0.9E-02				
	(0.126)				
LIIL	-0.054	0.436			
	(0.227)	(0.295)			
LRIH		-0.058	0 281 ***		
		(0.061)	(0 097)		
LITL			-0 315	0.679 ***	
			(0 463)	(0.241)	
LRD				0.306	1.829 **
				(0.929)	(0.885)
LIFL					-0.662
					(0.457)
LTCC	0 038				
	(0.066)				
LTCIL	0.018	0.835 ***			
	(0.066)	(0.292)			
LTCIH		-0.5E-02	1.382 ***		
		(0.232)	(0.226)		
LTCTL			-0.186	0.4E-02	
			(0.160)	(0.069)	
LTCD				-0.115	0.323 ***
				(0.076)	(0.108)
LTCFL					-0.231 **
					(0.118)
ILHAT	-6.441				
	(10.17)				
IHHAT		0.106			
		(0.097)			
TLHAT			0.961		
			(1.038)		
DHAT				-1.162 **	
				(0.564)	
FLHAT					5.279 ***
					(1.351)
R-SQR	0.18				
LH		138.25	-109.78	-99.90	-54.75

Asymptotic standard errors are reported in parentheses.
***, ** & * represent significance at 1, 5 and 10 percent levels, respectively.

APPENDIX

The Theoretical Framework

Capital structure analysis reveals important insights into the entrepreneur's choices of the sources of finance used to finance the operation of the enterprise. The financing of enterprises can be modeled by assuming a one-period world where entrepreneurs possess a certain amount of wealth to be allocated among different assets. The analysis considers an entrepreneur who knows with certainty production outcomes and all other variables in the model. The entrepreneur operates a manufacturing business where output is produced using a stock of physical capital (K) and a flow of variable inputs. Financing the vector of variable inputs used in production makes up the operating costs which add up to total expenditures (T) over the production period. The characteristics of the particular manufacturing sub-sector have a direct impact on the nature of the physical capital and variable inputs used in production. The sub-sector effect is captured by dummy variables representing the sub-sectors included in the study. Moreover, entrepreneurial or managerial abilities (A) are considered as an indirect input in the production function. Proxy variables, such as the characteristics of the entrepreneur and the enterprise capture the effects of entrepreneurial abilities. The price of output (P) is exogenous and the firm's revenue function is specified as:

$$Y = Y(K, T, A, P). \tag{1}$$

The entrepreneur augments initial wealth, or equity, (W) by drawing on external sources of financing at the beginning of the period which amount to:

$$[(1-\delta)B] \qquad 0 < \delta < 1$$

where (B) is total borrowing by the end of the production period and δ is the proportion of total borrowing which is used over the production period. Over the production period, the entrepreneur draws on (δB) to finance operating costs (T) which amount by the end of the production period to total borrowing (B). The different sources of external finance are non-commercial informal loans (IL) provided by fellow entrepreneurs, friends and relatives; trade finance from suppliers and customers (TL); and formal loans (FL) from commercial banks and other non-bank institutions such as special microenterprise programs. The part of these liabilities (δB) is drawn upon during the production period at a continuous and constant rate to finance the operating costs (T). More specifically,

$$\delta B = \delta_1 IL + \delta_2 TL + \delta_3 FL$$

where the parameters δ_i, i=1,2,3 are associated with IL, TL and FL, respectively, $0 < \delta_i < 1$, and represent the proportion of each liability that is used to fund the operating costs.

The entrepreneur allocates the resources available to the firm [W + (1-δ)B] among financial assets (FA) and physical assets (K). The various forms of financial assets are: cash holdings (C); informal savings with moneykeepers and rotating savings and credit associations (IH); and formal deposits with commercial banks (D). Over the production period, the entrepreneur draws upon the alternative financial assets and liabilities to finance the cost of inputs. The returns (r), interest rates (i) and transaction costs (t) associated with these assets and liabilities are respectively: (r_i), (i_j) and ($t_{i,j}$), where i= C, IH, D and j= IL, TL, FL. In order for the firm to fund the rest of its operating costs (T), a part of these assets (αFA) is drawn upon at a continuous and constant rate. More specifically,

$$\alpha FA = \alpha_1 C + \alpha_2 IH + \alpha_3 D$$

where the parameter α_i, i=1,2,3 is associated with C, IH and D, respectively, $0 < \alpha_i < 1$, and represents the proportion of each asset that is used to fund the operating costs.

The firm's balance sheet constraint at the beginning of the period may be expressed as:

$$K + FA = W + (1-\delta)B \tag{2}$$

and the flow of operating costs during the production period may be expressed as:

$$T = \alpha_1 C + \alpha_2 IH + \alpha_3 D + \delta_1 IL + \delta_2 TL + \delta_3 FL \tag{3}$$

The returns on the financial assets and the interest rate cost of the liabilities may be expressed following the inventory theory.[3] Since the fraction of the production period during which cash is used is (α_1C/T), and the average cash holding during this fraction of the production period is (α_1C/2),[3] the total yield on cash holdings is thus:

$$r_C C - r_C[(\alpha_1 C/T)(\alpha_1 C/2)]$$

By analogy, the total returns on financial holdings may be expressed as:

$$r(FA) = r_C C - r_C(\alpha_1 C/T)(\alpha_1 C/2) + r_{IH} IH - r_{IH}(\alpha_2 IH/T)(\alpha_2 IH/2) + r_D D - r_D(\alpha_3 D/T)(\alpha_3 D/2) \tag{4}$$

Similarly, the costs associated with the liabilities drawn upon during the production period may be expressed in a way analogous to inventory theory. Since the fraction of the production period during which informal loans are used is (δ_1IL/T), and the average informal debt during this fraction of the production period is (δ_1IL/2), the total cost of informal loans is thus:

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[3] Expenditure on operating costs are assumed to occur at a constant and continuous rate during the production period.

$$i_{IL}(1-\delta_1)IL + i_{IL}[(\delta_1 IL/T)(\delta_1 IL/2)]$$

By the same analogy the total interest rate costs of the liabilities may be expressed as:

$$\begin{aligned} i(B) = {} & i_{IL}(1-\delta_1)IL + i_{IL}(\delta_1 IL/T)(\delta_1 IL/2) + i_{TL}(1-\delta_2)TL + i_{TL}(\delta_2 TL/T)(\delta_2 TL/2) \\ & + i_{FL}(1-\delta_3)FL + i_{FL}(\delta_3 FL/T)(\delta_3 FL/2) \end{aligned} \quad (5)$$

Assuming no depreciation of physical assets during the production period, the firm's income statement would yield retained earnings (RE) as the total revenue from production and financial assets net of expenditures on operating costs, interest costs on liabilities and transaction costs associated with financial assets and liabilities t(FA, B). This may be expressed as:

$$RE = Y(K,T,A,P) + r(FA) - T - i(B) - t(FA,B) \quad (6)$$

Table 1 presents a summary of the abbreviated variable names and their definitions.

Following the standard microeconomic theory of the firm, the problem becomes one of maximization of retained earnings in the objective function with respect to the decision variables (K, T, C, IH, D, IL, TL, FL) subject to the balance sheet constraint (2) and the expenditure flow identity (3). This may be written as:

$$\text{MAX} \qquad RE = Y(K,T,A,P) + r(FA) - T - i(B) - t(FA,B) \quad (6)$$

s.t.

$$K + FA = W + (1-\delta)B \quad (2)$$

$$T = \alpha_1 C + \alpha_2 IH + \alpha_3 D + \delta_1 IL + \delta_2 TL + \delta_3 FL \quad (3)$$

$$0 \le (K, T, C, IH, D, IL, TL, FL)$$

$$0 \le \alpha_i, \delta_i \le 1$$

and given that:

$$\begin{aligned} FA &= C + IH + D \\ (1-\delta)B &= (1-\delta_1)IL + (1-\delta_2)TL + (1-\delta_3)FL \\ r(FA) &= r_C C - r_C(\alpha_1 C/T)(\alpha_1 C/2) + r_{IH} IH - r_{IH}(\alpha_2 IH/T)(\alpha_2 IH/2) \\ &\quad + r_D D - r_D(\alpha_3 D/T)(\alpha_3 D/2) \quad (4) \\ i(B) &= i_{IL}(1-\delta_1)IL + i_{IL}(\delta_1 IL/T)(\delta_1 IL/2) + i_{TL}(1-\delta_2)TL + i_{TL}(\delta_2 TL/T)(\delta_2 TL/2) \\ &\quad + i_{FL}(1-\delta_3)FL + i_{FL}(\delta_3 FL/T)(\delta_3 FL/2) \quad (5) \end{aligned}$$

The Lagrangian for this problem is expressed as:

$$L = RE + L_1(W + (1-\delta)B - K - FA) + L_2(T - \alpha_1 C - \alpha_2 IH - \alpha_3 D - \delta_1 IL - \delta_2 TL - \delta_3 FL)$$

Differentiating with respect to the decision variables yields the first order conditions. Solving the first order condition equations for the proportions of the different sources of financing (C/T),

(IH/T), (D/T), (IL/T), (TL/T) and (FL/T) for a given (T) yields the following simultaneous equations system:

$(C/T) = f(r_C, t_C, Y_K, i_{IL}, t_{IL}, (IL/T))$
$(IL/T) = f(i_{IL}, t_{IL}, Y_K, r_{IH}, t_{IH}, (IH/T))$
$(IH/T) = f(r_{IH}, t_{IH}, Y_K, i_{TL}, t_{TL}, (TL/T))$
$(TL/T) = f(i_{TL}, t_{TL}, Y_K, r_D, t_D, (D/T))$
$(D/T) = f(r_D, t_D, Y_K, i_{FL}, t_{FL}, (FL/T))$
$(FL/T) = 1/\delta_3 [1-(\alpha_1 C/T)-(\alpha_2 IH/T)-(\alpha_3 D/T)-(\delta_1 IL/T)-(\delta_2 TL/T)]$

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